

CLAIMS:

1. Data processing device for performing a reconstruction of computed tomography data, wherein the computed tomography data is reconstructed from acquired CT data comprising at least a partial spectrum acquired by using a detector comprising energy resolving detector elements, wherein a memory is provided for
5 storing at least one of the acquired CT data and the computed tomography data, and wherein a processor is provided which is adapted to perform at least the following operation: determining a wave-vector transfer by using the at least partial spectrum; determining a reconstruction volume; wherein a dimension of the reconstruction volume is determined by the wave-vector transfer; wherein the wave-vector transfer represents
10 curved lines in the reconstruction volume; and rearranging the acquired CT data such that it corresponds to an acquisition along a desired source trajectory in the reconstruction volume.
2. The data processing device of claim 1, wherein the acquired CT data is
15 acquired during an acquisition wherein a source of radiation is displaced along a first source trajectory; wherein the acquired CT data are rearranged such that it corresponds to an acquisition along a second source trajectory in the reconstruction volume which is different to the first source trajectory; wherein the first source trajectory is a circle and the second source trajectory is a helix.
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3. The data processing device of claim 1, wherein the processor is furthermore adapted to perform a filtered back-projection along the curved lines in the reconstruction volume.
- 25 4. The data processing device of claim 1, wherein the reconstruction volume is furthermore determined by two linear independent vectors of the rotation plane; and wherein the detector is a two dimensional detector.

5. The data processing device of claim 1, wherein the rearranging of the acquired CT data such that it corresponds to an acquisition along a helical source trajectory in the reconstruction volume is performed by using John's Equation.

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6. The data processing device of claim 1, wherein the rearranging of the acquired CT data such that it corresponds to an acquisition along a helical source trajectory in the reconstruction volume is performed by using the following equation:

$$q = \tilde{q} + \frac{1}{2hc} \left[\frac{d_{\min} + d_{\max} - d}{d_{\min} \times d_{\max}} \right] \alpha E,$$

10 with q being the wave-vector transfer, \tilde{q} being a virtual position of an x-ray source, h being the Planck's constant, c being the speed of light, α denoting an angular position of the x-ray source in the rotational plane, E being an energy of a corresponding x-ray photon, d denoting a distance from a scatter center of the corresponding x-ray photon from the detector and d_{\min} and d_{\max} being a beginning and an end of a region of interest
15 of the curved lines in the reconstruction volume.

7. A computer tomography apparatus for examination of an object of interest, the computer tomography apparatus comprising: a detector unit with an x-ray source and a scatter radiation detector; wherein the detector unit is rotatable around a
20 rotational axis extending through an examination area for receiving the object of interest; wherein the x-ray source generates a fan-shaped x-ray beam adapted to penetrate the object of interest in the examination area in a slice plane; wherein the scatter radiation detector is arranged at the detector unit opposite to the x-ray source with an offset with respect to the slice plane in a direction parallel to the rotational axis;
25 wherein the scatter radiation detector includes a plurality of first detector elements; wherein the plurality of first detector elements are energy-resolving detector elements; and a data processor which is adapted to perform at least the following operation: determining a wave-vector transfer by using the spectrum acquired by using the scatter radiation detector; determining a reconstruction volume; wherein a dimension of the
30 reconstruction volume is determined by the wave-vector transfer; wherein the wave-

vector transfer represents curved lines in the reconstruction volume; and rearranging the acquired CT data such that it corresponds to an acquisition where the x-ray source is displaced along a desired source trajectory in the reconstruction volume.

5 8. The computer tomography apparatus of claim 7, wherein the scatter radiation detector is a two-dimensional detector.

9. The computer tomography apparatus of claim 7, wherein the scatter radiation detector is arranged at the detector unit opposite to the x-ray source parallel to
10 the slice plane and out of the slice plane with such an offset along the rotational axis such that the scatter radiation detector is arranged for receiving a scatter radiation scattered from the object of interest; and wherein the acquired CT data is acquired during an acquisition wherein the x-ray source is displaced along a first source trajectory; wherein the acquired CT data are rearranged such that it corresponds to an
15 acquisition along a second source trajectory in the reconstruction volume which is different to the first source trajectory; wherein the first source trajectory is a circle and the second source trajectory is a helix.

10. The computer tomography apparatus of claim 7, wherein the acquired CT
20 data is acquired during a circular acquisition wherein a source of radiation is rotated around an object of interest in a rotation plane; wherein the processor is furthermore adapted to perform a filtered back-projection along the curved lines in the reconstruction volume; and wherein the reconstruction volume is furthermore determined by two linear independent vectors of the rotation plane.

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11. The computer tomography apparatus of claim 10, wherein the rearranging the acquired CT data such that it corresponds to an acquisition along a helical source trajectory in the reconstruction volume is performed by using the following equation:

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$$q = \tilde{q} + \frac{1}{2hc} \left[\frac{d_{\min} + d_{\max} - d}{d_{\min} \times d_{\max}} \right] aE,$$

with q being the wave-vector transfer, \tilde{q} being a virtual position of the x-ray source, h being the Planck's constant, c being the speed of light, α denoting an angular position of the x-ray source in the rotational plane, E being an energy of a corresponding x-ray photon, d denoting a distance from a scatter center of the corresponding x-ray photon from a detector including the scatter radiation detector and d_{\min} and d_{\max} being a beginning and an end of a region of interest of the curved lines in the reconstruction volume.

12. Method of performing a reconstruction of computed tomography data, wherein the computed tomography data is reconstructed from acquired CT data comprising at least a partial spectrum acquired by using a detector comprising energy resolving detector elements, the method comprising the steps of: determining a wave-vector transfer by using the at least partial spectrum; determining a reconstruction volume; wherein a dimension of the reconstruction volume is determined by the wave-vector transfer; wherein the wave-vector transfer represents curved lines in the reconstruction volume; and rearranging the acquired CT data such it corresponds to an acquisition along a desired source trajectory in the reconstruction volume.

13. The method of claim 12, wherein the acquired CT data is acquired during an acquisition wherein a source of radiation is displaced along a first source trajectory; wherein the acquired CT data are rearranged such that it corresponds to an acquisition along a second source trajectory in the reconstruction volume which is different to the first source trajectory; wherein the first source trajectory is a circle and the second source trajectory is a helix; and wherein the detector is a two dimensional detector.

14. The method of claim 13, wherein the rearranging the acquired CT data such that they correspond to an acquisition along a helical source trajectory in the reconstruction volume is performed by using the following equation:

$$q = \tilde{q} + \frac{1}{2hc} \left[\frac{d_{\min} + d_{\max} - d}{d_{\min} \times d_{\max}} \right] aE,$$

with q being the wave-vector transfer, \tilde{q} being a virtual position of an x-ray source, h being the Planck's constant, c being the speed of light, α denoting an angular position

of the x-ray source in the rotational plane, E being an energy of a corresponding x-ray photon, d denoting a distance from a scatter center of the corresponding x-ray photon from the detector and d_{\min} and d_{\max} being a beginning and an end of a region of interest of the curved lines in the reconstruction volume.

- 5 15. Computer program for a data processor for performing a reconstruction of computed tomography data, wherein the computed tomography data is reconstructed from acquired CT data comprising at least a partial spectrum acquired by using a detector comprising energy resolving detector elements, wherein the computer program
- 10 causes the data processor to perform the following operation: determining a wave-vector transfer by using the at least partial spectrum; determining a reconstruction volume; wherein a dimension of the reconstruction volume is determined by the wave-vector transfer; wherein the wave-vector transfer represents curved lines in the reconstruction volume; and rearranging the acquired CT data such that they correspond
- 15 to an acquisition along a desired source trajectory in the reconstruction volume.